

C-5.4 Illustrate and interpret heating and cooling curves (including how boiling and melting points can be identified and how boiling points vary with changes in pressure).

**Revised Taxonomy Level      2.2-B   Exemplify (illustrate) conceptual knowledge**

**In physical science students**

- ❖ Explain the process of phase change in terms of temperature, heat transfer, and particle arrangement (PS-3.7)
  - Physical science students explain phase change in terms of the Kinetic Molecular Theory
  - Physical science students explain why temperature vs. time graphs show constant temperature during phase change.

**It is essential for students to**

- ❖ Define phase changes in terms of kinetic energy of the particles, heat transfer, and particle orientation and arrangement.
  - melting
  - boiling
  - condensation
  - freezing
  - sublimation
- ❖ Differentiate the processes of evaporation and boiling
- ❖ Differentiate the terms gas and vapor
- ❖ Explain how atmospheric pressure and vapor pressure affect the boiling point of a substance
  - Analyze a phase diagram (temperature vs. pressure)
    - ◆ Explain triple point
    - ◆ Critical point
- ❖ Analyze a graph of temperature vs time which illustrates the heating or cooling of a substance over the range of phase change.
  - Explain the shape of the graph in terms of kinetic energy, potential energy, and heat transfer

**❖ Assessment**

The verb exemplify (illustrate) means to find a specific example or illustration of a concept or principle, therefore the major focus of assessment will be for students to give examples that show that they understand phase change in terms of the Kinetic Molecular Theory. Conceptual knowledge requires that students understand the interrelationships among the basic elements within a larger structure that enable them to function together. In this case, that students understand how pressure and temperature, and heat flow affect the kinetic energy, potential energy, and orientation of the particles of a substance.